

2nd Assignment – Operators, loops and plotting data sets

Task 1

Consider matrix $\mathbf{A}=[0 \ 2 \ 3; 4 \ 5 \ 6; 7 \ 8 \ 9]$ and matrix $\mathbf{B}=[0 \ 0 \ 0; 1 \ 2 \ 3; 7 \ 8 \ 9]$.

- 1) Compare the two matrices and save the values where \mathbf{A} and \mathbf{B} are equal into vector \mathbf{e} ;
- 2) Set all elements in \mathbf{A} that are smaller than 5 to zero.

Task 2

What results does the loop below produce? Type in the code and run it to confirm your answer.

```
a=0;
b=1;
for j=1:5
    a=a+b;
    b=a+b;
end
```

Task 3

Table 1 shows the maximum wind speed values [m/s] for three different point locations with given coordinates (X, Y in WGS84): Denmark, South Sweden and North Norway for 9 examples out of in total 52 extreme storm events in Europe.

Table 1. Extreme wind speeds [m/s] per storm event for three locations in Denmark, Sweden and Norway. The 3 second gust wind speed data for the European extreme events that occurred between 1979 and 2013 are provided in the XWS catalogue <http://www.europeanwindstorms.org/>.

	Denmark (D)	Sweden (S)	Norway (N)
X Coordinate [m]	536594	324936	614800
Y Coordinate [m]	6234901	6397830	7597946
Storm event	wind speed [m/s]		
Anatol	31.75	31.13	0.0
Christian	14.88	19.63	4.38
Dagmar	20.25	19.88	19.63
Daria	29.13	27.13	0.0
Dec11	11.00	14.13	0.0
Dec93	17.38	18.50	0.0
Emma	26.75	25.63	0.0
Erwin	32.00	39.13	9.00
Fanny	8.25	16.38	0.0
...

Create a Matlab program (*.m file) that computes the statistics of the data and performs plots for their graphical representation.

- a) Load the wind speed data from EuropeanWindStorms.dat as well as the information about the location coordinates from PointCoordinates.dat.
- b) Calculate the Euclidian distances between the three locations in km.

- c) Plot the data of the three locations into one figure using three different point styles and compare how the three data sets differ. Give the axis of your plot some meaningful labels.
- d) Calculate the correlation coefficients between the data sets. Conclude: How are they related? Also, consider their distances.

Make one scatter plot for the data samples of Denmark versus Sweden and one for the data samples of Denmark versus Norway.

- e) Plot the histograms and the cumulative frequency diagram for Denmark and Norway separately. How do they compare? For better comparison, also compute the statistics of both data sets, i.e. the range, sample mean, sample median and sample standard deviation.
- f) Plot the box plots for Denmark and Norway into one figure. Which of the two locations shows outliers? Determine the outliers as the samples with values greater than $1.5iqr$ above the third quartile and the samples with values less than $1.5iqr$ below the first quartile, where iqr is the interquartile range.